

**VIJAYA COLLEGE**  
**R. V. Road, Basavanagudi, Bengaluru – 560004**  
**DEPARTMENT OF MICROBIOLOGY**  
**ACADEMIC PLANNER 2022-23**  
**NEP 2<sup>nd</sup> SEMESTER**

<b>Name of the Department: MICROBIOLOGY</b>	<b>Subject Title : Microbial Biochemistry and Physiology</b>	
<b>Semester</b>	<b>Paper: MBL 101</b>	
	<b>Portions Planned for 1 hour</b>	<b>Teacher</b>
MAY 1 <sup>st</sup> week	Major Elements of life and their primary characteristics	MS
	Carbohydrates – Definition, classification, structure	KM
	Atomic and Chemical bonds – covalent & Non-covalent	MS
May 2 <sup>nd</sup> week	Carbohydrates – Properties, functions	KM
	Amino acids & proteins – definition, structure, classification	KM
	Atomic and Chemical bonds – Ionic, hydrogen & van der waals	MS
	Amino acids & proteins – properties, functions	KM
May 3 <sup>rd</sup> week	Biological solvents – structure and properties of water, water as universal solvent	MS
	Lipids & fats - definition, structure, classification	KM
	Water – polarity, hydrophobic and hydrophilic interactions	MS
	Lipids & fats - properties, functions	KM
May 4 <sup>th</sup> week	Acids, bases, electrolytes	MS
	Porphyrins & Vitamins - definition, structure, properties	KM
	Microbial Growth – definition, growth curve, phases of growth	MS
	Porphyrins & Vitamins – Importance of Chlorophyll, cytochromes & hemoglobin	KM
May 5 <sup>th</sup> Week	pH & buffers, Henderson-Hasselbalch equation	MS
	Bioenergetics – Free energy, enthalpy, entropy	KM

	Growth Kinetics, Generation time	MS
	Laws of thermodynamics	KM
JUNE 2 <sup>nd</sup> week (3)	Synchronous culture, continuous culture (chemostat & turbidostat)	MS
	High energy compounds – classification, structure, significance	KM
	Coulter cultures, diauxic growth	MS
JUNE 3 <sup>rd</sup> week	Oxidation reduction reactions, equilibrium constant, redox potential	KM
	Measurement of growth – DMC, Hemocytometer, viable count	MS
	Microbial respiration – Electron transport chain	KM
	Membrane filtration, electronic counting	MS
JUNE 4 <sup>th</sup> week	Protein translocation	KM
	Measurement of cell mass, Turbidity measurements – Nephelometer & Spectrophotometer	MS
	Oxidative & Substrate level phosphorylation	KM
	Measurement of cell constituents, Growth yield	MS
JUNE 5 <sup>th</sup> week	Internals	
JULY 1 <sup>st</sup> week	Inhibitors of ETC	KM
	Influence of environmental factors on growth	MS
	ATP synthase – structure & function, ATP synthesis	KM
	Microbial Nutrients – macro & micro	MS
JULY 2 <sup>nd</sup> week	Homolactate fermentation	KM
	Heterolactate fermentation	KM
	Membrane transport – Biological membranes	MS
	Light reaction, light harvesting pigments	KM
JULY 3 <sup>rd</sup> week	Passive, facilitated and active transport	MS
	Group translocation, membrane bound protein transport system	MS
	Photophosphorylation	KM
	CO <sub>2</sub> fixation pathways – Calvin cycle	KM
JULY 4 <sup>th</sup> week	Carrier models, liposomes	MS
	CO <sub>2</sub> fixation pathways – CODH pathway	KM
	Ion channels, Na <sup>+</sup> K <sup>+</sup> ATPase	MS
	CO <sub>2</sub> fixation pathways – Reductive TCA pathway	KM

AUGUST 1 <sup>st</sup> week	Revision	MS
	Revision	KM
	Discussion of old University question papers	MS
	Class Test 1	KM
AUGUST 2 <sup>nd</sup> week	Class test 2	MS
	Open book test	KM
	Open book test	MS
	Revision	KM

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**4<sup>th</sup> SEMESTER**

<b>Name of the Department</b>	<b>Subject Title :</b> <b>Microbial Enzymology and Metabolism</b>	
<b>Semester</b>	<b>Paper: MBL104</b>	
	<b>Portions Planned for 1 hour</b>	<b>Teacher</b>
MAY 1 <sup>st</sup> week	EMP pathway	KM
	Introduction to enzymes	MS
	HMP pathway	KM
	Definition, enzyme unit, specific activity and turnover number	MS
May 2 <sup>nd</sup> week	ED & PK pathway	MS
	Properties of enzymes	KM
	TCA cycle	MS
	Classification of enzymes	KM
May 3 <sup>rd</sup> week	Fermentation balance, concept of linear and branched fermentation pathways	MS
	Exo/endo enzymes, constitutive/ induced enzymes, isozymes	KM
	Alcohol fermentation and Pasteur effect	MS
	Monomeric, Oligomeric and Multimeric enzymes.	MS
May 4 <sup>th</sup> week	Butyric acid and Butanol-Acetone Fermentation, Mixed acid and 2,3-butanediol fermentation	KM
	Multienzyme complex: pyruvate dehydrogenase; isozyme: lactate dehydrogenase	MS
	Propionic acid Fermentation, acetate fermentation.	KM
	Ribozymes, Abzymes	MS
June 1 <sup>st</sup> week	Chemolithotrophy-Oxidation of Hydrogen, Sulphur	MS
	Apoenzyme and cofactors	KM
	Chemolithotrophy-Oxidation of Iron & Nitrogen	MS
	Prosthetic group-TPP, coenzyme, NAD, metal cofactors.	KM
JUNE 2 <sup>nd</sup>	Anaerobic respiration- dissimilatory nitrate reduction and sulphate reduction.	MS

week	Mechanism of action of enzymes	KM
	Nitrogen fixation, Ammonia assimilation.	MS
	Activesite, transition state complex and activation energy.	KM
JUNE 3 <sup>rd</sup> week	Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification	MS
	Lock and key hypothesis and Induced Fity pothesis.	MS
	Biosynthesis of nucleic acids : De novo pathway	KM
	Multi substrate reactions- Ordered, Random and Ping-pong	MS
JUNE 4 <sup>th</sup> week	Biosynthesis of nucleic acids : Salvage pathway	KM
	Enzyme Kinetics: Kinetics of one substrate reactions	KM
	Aminoacid degradation and biosynthesis	MS
	i.Equilibrium assumptionii. Steadystate Assumptions iii. Lineweaver-Burk, Hanes-Woolf, Eadie-Hofstee equations and plots.	KM
JUNE 5 <sup>th</sup> week	INTERNALS	
JULY 1 <sup>st</sup> week	$\beta$ -oxidation of palmitic acid;	MS
	Kinetics of enzyme inhibition. Competitive, non-competitive and uncompetitive inhibition.	KM
	Biosynthesis of palmitic acid.	MS
	Effect of changes in pH and temperature on enzyme catalyzed reaction.	KM
JULY 2 <sup>nd</sup> week	Acetogens: Autotrophic pathway of acetate synthesis	MS
	Kinetics of two substrate reactions. Presteadystate kinetics.	KM
	Ethanol oxidation, sugar alcohol oxidation.	KM
	Kinetics of immobilized enzymes	MS
JULY 3 <sup>rd</sup> week	Glyoxylate and glycolate metabolism	KM
	Enzyme regulation: Allosteric enzyme - general properties, Hill equation, Koshland Nemethy and Filmer model,	MS
	Dicarboxylic acid cycle	KM
	Monod Wyman and Changeux model	MS
JULY 4 <sup>th</sup> week	Glycerate pathway	KM
	Covalent modification by variousmechanisms. Regulation by proteolytic cleavage - blood coagulation cascade.	MS
	Beta hydroxyl aspartate pathway	KM
AUGUST 1 <sup>st</sup> week	Regulation of multi-enzyme complex- Pyruvate dehydrogenase. Feedback inhibition.	KM
	Oxalate as carbon and energy source	MS
	Revision	MS

	Discussion of old University question papers	KM
AUGUST 2 <sup>nd</sup> week	Class Test 1	MS
	Class test 2	KM
	Open book test	MS
		KM

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**6<sup>th</sup> SEMESTER**

Name of the Department	<b>Subject Title : Immunology &amp; Medical Microbiology</b>	
Semester	<b>Paper: MBT 601 (paper 7)</b>	
	<b>Portions Planned for 1 hour</b>	<b>Teacher</b>
APRIL 3 <sup>rd</sup> week	History and scope of Immunology	KM
	Major developments in medical microbiology	MS
	Immunity: types, natural, acquired	KM
April 4 <sup>th</sup> week	Antigens : Definition, types, factors influencing antigenicity	KM
	Factors responsible for microbial pathogenicity	MS
	Factors responsible for microbial pathogenicity	MS
May 1 <sup>st</sup> week	Antibodies: Properties and types of Immunoglobulins	KM
	Antibodies: definition, Structure and types	KM
	Microbial flora of human body	MS
MAY 2 <sup>nd</sup> week	Antigen-antibody reaction: Complement fixation test, Agglutination and precipitation	KM
	Production and applications of Polyclonal & Monoclonal antibodies	MS
	Immunoelectrophoresis Complement system-properties, components	MS
MAY 3 <sup>rd</sup> week	Antigen-antibody reaction: Labelled antibodies-RIA, ELISA	KM
	Complement system: Pathways and function	KM
	Antigen-antibody reaction: : Labelled antibodies-Immunofluorescence	MS
MAY 4 <sup>th</sup> week	Cells, tissues and organs involved in immune system	KM
	Vaccines- Live attenuated Vaccines, Killed vaccines, Toxoid,	MS
	Cells, tissues and organs involved in immune system	MS
MAY 5 <sup>th</sup> Week	Immune response: CMI	KM
	Bacterial diseases: Syphilis	KM
June 1 <sup>st</sup> week	Vaccines- Recombinant vaccines DNA vaccines, Synthetic vaccines	MS
	Immune response: MHC	KM
	Bacterial diseases: Tetanus	MS

JUNE 2 <sup>nd</sup> week	Immune response :AMI,	KM
	Immunological memory and tolerance Hypersensitivity	MS
	Immune response :Tolerance	MS
JUNE 3 <sup>rd</sup> week	Bacterial diseases: Typhoid	KM
	Hypersensitivity	MS
	Bacterial diseases: Cholera	KM
JUNE 4 <sup>th</sup> week	Viral Diseases: Rabies	MS
	Bacterial diseases: Tuberculosis	KM
	Bacterial diseases:Diphtheria	MS
JUNE 5 <sup>th</sup> week	Internals	
JULY 1 <sup>st</sup> week	Viral Diseases:HIV	KM
	Protozoan Diseases: Amoebiasis, Malaria	MS
	Viral Diseases: Hepatitis A&B	KM
JULY 2 <sup>nd</sup> week	Fungal Diseases: Candidiasis, Cutaneous mycoses	MS
	Discussion of old university question papers	KM
	Revision	MS
JULY 3 <sup>rd</sup> week	Open book test	KM



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**6<sup>th</sup> SEMESTER**

Name of the Department	Subject Title : Industrial Microbiology & Microbial Technology	
Semester	Paper: MBT 603 (paper 8)	
	Portions Planned for 1 hour	Teacher
APRIL 3 <sup>rd</sup> week	History, scope and development of Industrial Microbiology	KM
	Isolation and screening of industrially important microorganisms	MS
	Immobilization of enzymes	KM
April 4 <sup>th</sup> week	Strain Improvement methods	KM
	Immobilization of cells	MS
	Production of Industrial alcohol	MS
May 1 <sup>st</sup> week	Types of industrial fermentation processes: Batch and Continuous	MS
	Types of industrial fermentation processes: Surface, Submerged and SSF	KM
	Production of beer and whisky	MS
MAY 2 <sup>nd</sup> week	Media components and formulation: Crude media components and antifoam agents	MS
	Production of wine	KM
	Production of Citric acid	MS
MAY 3 <sup>rd</sup> week	Media components and formulation: Precursors, inducer	MS
	Media components and formulation: Inhibitors and buffering agents	KM
	Production of Vitamin B12	MS
MAY 4 <sup>th</sup> week	Sterilization of media and raw materials	MS
	Production of Glutamic acid	MS
	Production of Penicillin	KM
MAY 5 <sup>th</sup> Week June 1 <sup>st</sup> week	Maintenance of sterility at critical control points during fermentation	KM
	Inoculation preparation	KM
	Production of Amylase	MS
JUNE 2 <sup>nd</sup> week	Process parameters- aeration, agitation	KM
	Process parameters- Foam regulation and pH regulation	MS
	Biofuels : Methane gas production	MS

JUNE 3 <sup>rd</sup> week	Fermentor-Basic structure	MS
	Construction of Typical stirred aerated fermentor	KM
	Production of Vaccines: Hepatitis	KM
JUNE 4 <sup>th</sup> week	Biofuels : Hydrogen gas production	KM
	Fermentor-Basic structure and Construction of Tower fermentor	MS
	Production of Hormone: Human Insulin	KM
JUNE 5 <sup>th</sup> week	Biotransformation of Steroids	KM
	Fermentor-Basic structure and Construction of air lift fermentor	MS
	Fermentor-Basic structure and Construction of Bubble a/c fermentor	KM
JULY 1 <sup>st</sup> week	Biotransformation of Steroids	KM
	Down-stream processing steps. Recovery of fermented broth, disintegration of cells	MS
	Mushroom cultivation	
JULY 2 <sup>nd</sup> week	Purification and concentration methods of byproducts chromatographic techniques affinity column, HPLC	KM
	Purification and concentration methods of byproducts chromatographic techniques ion exchange and GLC	MS
	Discussion of question bank	MS
JULY 3 <sup>rd</sup> week	Discussion of old university question papers	KM
	Revision	MS